THE MORTALITY FROM PUERPERAL INFECTION IN CHICAGO.*

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The accompanying table (Table A) comprises all the data that I have been able to obtain concerning the mortality from all puerperal diseases in Chicago for the last forty years. I will postpone to some future occasion the discussion of the non-infectious puerperal diseases, and will confine myself to puerperal infections. I will first describe the sources from which the data for the table have been obtained, and will then mention some of the interesting deductions which can be drawn from it, and make a few comparisons with statistical reports from other cities and countries.

The mortality statistics are taken from the annual reports of the City Board of Health. I have divided the forty years into decennial periods. The figures for the first decennium are the least reliable. As will be seen, nearly all deaths from puerperal affections are classed under puerperal fever or childbirth. As will be shown, many deaths ascribed to childbirth are due to puerperal infection, and a method of correcting the error in the latter cases will be given. An estimate of some value as to the ratio of puerperal infections to puerperal diseases can probably be made, but the ratio of deaths in childbed to all deaths is perhaps as accurate in this period as in the succeeding decades.

The mortality records of Chicago begin with the year 1851. The

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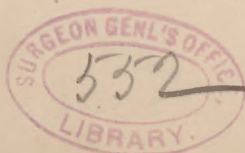
records for 1851, 1852, and 1853 are especially meager, and there is no advantage in considering any statistics prior to 1856.

In the report of the Health Department for 1894, on page 263, there is a table giving the mortality from puerperal fever since 1851. The discrepancies between the figures there given and those in my tables, I will not attempt to reconcile, but the results I give have been obtained by careful search through all the records, and I believe them to be as reliable as can be secured.

Every one knows that all cases of death from puerperal infections are not returned in the death certificates as such. At the present time especially, the exogenetic character of puerperal fever is more or less generally recognized by the laity, and the admission by a physician of such a condition in a patient whom he had delivered would often subject him to grave reproach. Hence the frequency of typhoid fever, malarial fever, and similar diseases during the puerperium. Deaths from such causes can not here be considered. These errors are not confined to Chicago, but are particularly frequent in the country, if one may judge from current statements. I have often been told by country practitioners that they never see puerperal fever, but that they find malarial fever quite common in the puerperium.

Two or three years ago Reynolds began to study the statistics of puerperal fever in Boston, and was surprised to find that he himself had been called to see more cases of puerperal fever than had been reported that year. The unreliability of the statistics of puerperal infection is generally admitted, and statisticians have been obliged to correct the figures in the reports. Boxall, who has made very elaborate studies of the reports of the Registrar General in England and Wales, has added one twelfth to the recorded mortality from puerperal infection. Ingerslev, in a careful study of the mortality in Copenhagen and other Danish cities, after a consideration of all doubtful cases, adds about twenty per cent. to obtain the correct mortality from puerperal infection. In my statistics I have added on an average 16.5 per cent. for the whole period. This result has been reached in the following way; I have not taken into account the deaths occurring in the puerperium which are reported as due to non-puerperal diseases such as typhoid or malarial fever, rheumatism, or pneumonia. I have also not included reported deaths from septicæmia or peritonitis. During the last twenty years an average of about fifty deaths from septicæmia and about one hundred and thirty from peritonitis have been annually reported. A majority of these deaths occurred in fe-

males. Septicæmia must occur more frequently in men, since it so often results from injuries. Dr. Doherty, some months ago, selected from the recent records a considerable number of deaths reported as due to peritonitis, and wrote to the physicians making the reports in the endeavor to discover whether the peritonitis was of puerperal origin. He obtained but few replies; sufficient, however, as he informs me, to confirm the statement that certain deaths reported as peritonitis were cases of puerperal infection. Dr. Doherty's investigations, which are soon to be published, may increase the ratio which I have used in correcting the estimate of mortality from puerperal infection. Meantime I have no hesitation in saying that from ten to fifty or more deaths occur each year from childbed infection which are reported as due to non-puerperal septicæmia or peritonitis or non-puerperal fevers, etc. These errors tend to make my estimates conservative.

The cases that I have considered in correcting the table of deaths for puerperal infection are found in the two classes: 1. Deaths reported as due to metritis, metroperitonitis, metrophlebitis, pelvic peritonitis, pelvic cellulitis, and pelvic abscess. 2. Deaths reported as due to childbirth, abortion, and miscarriage. I believe that clinical observation proves that the cases of the first class are due to puerperal infection, gonorrhœal infection, or meddlesome gynæcology. One can not accurately determine from the records which of these infections produced the condition reported as the cause of death. Possibly something may be inferred from the duration of the disease. Nearly all of these deaths were of women of the childbearing age. The duration of the sickness, especially in the cases reported as metritis, metroperitonitis, and pelvic peritonitis, was generally from three to ten days, and corresponded in this respect with the cases of puerperal peritonitis. I add one half of these cases to the cases of puerperal infection, and in doing so feel certain that the number is rather underestimated.

The designation "Childbirth" as a cause of death is about as definite as "Visitation of God," which formerly often appeared on death certificates. I suppose the deaths ascribed to childbirth are due to hæmorrhage, embolism, etc.; to general pathological conditions, such as heart disease, nephritis, etc.; and to puerperal infection. The number of deaths due to puerperal infection which are reported as due to childbirth I have approximately estimated by considering the duration of the disease. If the deaths were due to hæmorrhage, embo-

lism, or other accidents of labor, such as rupture of the uterus, death would probably occur within two days in the great majority of cases. Deaths occurring later might be properly ascribed to infection. It may be said that three days is too short a period for puerperal fever to terminate fatally in any considerable number of cases. That the severest forms of puerperal septicæmia, however, may end fatally within this period is well known. I have attempted to get some data from the Chicago records to show the proportion of deaths that occur from puerperal infection in so short a time. In one hundred deaths, reported due to puerperal infection, I find the following duration of illness :

Two days, four cases ; three days, thirteen cases ; four days, fifteen cases ; five days, eight cases ; six days, six cases ; seven days, fourteen cases ; eight days, eight cases ; nine days, three cases ; ten days, six cases ; eleven days, one case ; twelve days, three cases ; fourteen days, seven cases ; fifteen days, one case ; twenty-one days, four cases ; twenty-four days, one case ; thirty-five days, one case ; forty-two days, one case ; not given, four cases.

In seventeen per cent. of the cases reported as puerperal fever death occurred within three days, and in forty per cent. within five days.

In order to estimate the duration of the disease in the cases reported as dying in "childbirth," I took at random a number of cases from the records of different years. These data are not given in the annual reports, and to look up all the cases from the record books would be an almost endless task. In about forty per cent. of these cases no duration of the disease is given. The records made before a physician's certificate of death was required show that sometimes there was no medical attendant. In about forty per cent. of these cases death occurred within two days. In twenty per cent. of these cases the duration of the sickness was more than two days. One of these cases was reported to have died after a sickness of three weeks. If the duration of the disease was over two days in only one half of the cases where the duration of disease was not given, we have forty per cent. of all cases reported as childbirth where the sickness lasted longer than two days. After allowing that death in some of these cases was due to other causes, I estimate that one third of all the deaths ascribed to "childbirth" were due to puerperal infection.

Quite similar results were obtained from a study of death due to "abortions" and "miscarriages."

I have therefore made a corrected list of deaths due to puerperal infection by adding to the number so reported one half of the deaths attributed to metritis, metroperitonitis, metrophlebitis, pelvic peritonitis, pelvic cellulitis, and pelvic abscess, and one third of the deaths attributed to childbirth, abortion, and miscarriage. These corrections for the last decennium amount to 14.4 per cent., for the period from 1876 to 1885 to 16.3 per cent., and for the entire period of forty years to about 16.5 per cent. The correction is nearly twice that of Boxall and about four fifths that of Ingerslev.

In order to obtain the total of deaths due to puerperal causes, I add to the number of deaths reported as due to puerperal infection 16.5 per cent. of this number, and also one half of the number of deaths due to "uterine hæmorrhage," which I consider was puerperal, as I shall explain when I discuss the non-infectious puerperal diseases.

These results show an average annual mortality of 165, or, as corrected, 189, from puerperal infection during the last decennium, and that 64.5 per cent., or, as corrected, 70.6 per cent., of all the deaths from puerperal causes were due to infection. This ratio is shown graphically in Diagram VII for each decennium. It is interesting to note that the corrected ratio does not differ greatly from that given by Ingerslev for the Danish cities for the years 1882 to 1889—namely, 74.2 per cent. Boxall finds the ratio of puerperal-fever mortality to puerperal mortality for England and Wales from 1847 to 1892 to be 40 per cent. From 1847 to 1880 the uncorrected ratio was 32.6 per cent. After 1880 the corrected ratio was 52.9 per cent. In Chicago probably more than two thirds of the puerperal mortality is due to infection.

In order to compare the number of deaths from puerperal infection in the different years and periods with each other and with statistics of other places, it is necessary to secure certain puerperal mortality rates. I have made four series of mortality rates by finding the ratio of puerperal deaths (1) to population; (2) to total number of deaths; (3) to number of deaths of women of childbearing age; and (4) to number of births or to number of confinements.

I have accepted the population as estimated by the Department of Health, which is obtained from the United States and State censuses and the city and school censuses. The number of deaths is taken from the various annual reports of the Health Department. The Health Department has now made corrections in the number of

deaths for the years previous to 1865, but, as I use the figures given in the annual reports for the puerperal mortality, I will also use the number of deaths as there given.

The childbearing age usually extends from fifteen to forty-five. The birth reports of Cook County show that not one half of one per cent. of all births occur after the age of forty-five, and over eight per cent. occur before the age of twenty. About two and a half per cent. occur between the ages of forty and forty-five. As the Health Department records are kept, it is impossible to find the number of deaths between fifteen and forty-five years. The deaths are given for decennial periods—as from eleven to twenty years; twenty-one to thirty years, etc. Since the ages of mothers in about eighty-nine per cent. of all confinements are between twenty and forty years, it might have been of value to compare the puerperal mortality with the number of female deaths between these ages. It is, however, true that the percentage of puerperal mortality outside the period of twenty to forty years is greater than the percentage of confinements outside the same period. This is particularly true of puerperal infection. In one year I noticed that only sixty per cent. of deaths from puerperal infection were within the period of twenty to forty years. Now, as I could not get the female mortality for the years fifteen to forty-five, I concluded to use the mortality for the ages twenty to fifty. I believe that the puerperal mortality rate thus obtained will be but little different from that which would be found if we had the other data, and what difference there is will be on the side of conservatism ; that is, we will get too small a puerperal mortality rate.

The Health Department reports, however, do not furnish the number of female deaths between twenty and fifty—only the total deaths between these ages. Hence it was necessary to estimate the number of female deaths. This I did by adopting the same ratio for female deaths from twenty to fifty to all deaths from twenty to fifty that I found between all female deaths and all deaths. This is somewhat too large a ratio, and gives me too many female deaths between twenty and fifty. As is well known, there are more males than females born, and, consequently, more die. It is especially during this period from twenty to fifty years that this greater death-rate prevails. The diseases which kill more men than women are all zymotic diseases, except septic diseases, dietetic diseases, diseases of the nervous, circulatory, and respiratory systems, and violence. Men are much more subject to these affections during the period from twenty to

fifty ; and hence the male death-rate would be much higher than the female, were it not for the especial danger to women caused by the reproductive system. The diseases which are more dangerous to women, apart from those of the reproductive system, are cancer, which is more common after forty years ; old age, which, of course, is a cause of death acting after fifty years ; and the septic diseases, which, as just stated, are chiefly of puerperal origin. Thus a study of mortality tables makes it probable that the male death-rate from twenty to fifty, as compared with the female death-rate for the same period, is greater than the ratio between all male deaths and all female deaths. This fact I have also confirmed from the vital statistics of New York, Brooklyn, Boston, and Philadelphia for the six years ending May 31, 1890, as furnished by Dr. Billings in the United States census reports. The number of female deaths between twenty and fifty years are there given, and, comparing these with the figures obtained by making the estimates in the way just suggested, I have obtained the following table :

	Female deaths between 20 and 50 years for 6 years ending May 31, 1890.	Ratio of all female deaths to all deaths.	Estimated number of female deaths between 20 and 50 years.
		Per cent.	
New York........	29,297	46.38	30,863
Brooklyn...........................	12,408	47.896	12,658
Boston.................	8,379	49.605	8,564
Philadelphia........................	15,932	47.395	16,023

It will be seen that the estimated exceeds the actual number of deaths in Philadelphia by 91 in a total of about 16,000 ; in Boston, by 185 ; in Brooklyn, by 250 ; and in New York, by over 1,500.

It is therefore evident that, when I compare the puerperal mortality with the estimated number of female deaths between the ages of twenty and fifty, I am getting a somewhat too low mortality rate, or I am again erring on the side of conservatism.

Not only in obstetric hospitals, but also in all foreign countries, puerperal mortality is very properly compared with the number of confinements. Such a mortality rate is very difficult to obtain in this country, because of our lack of an efficient system of birth registration. I do not need to dwell on the reasons for this condition of affairs. In Chicago not over half the births are reported ; hence the

birth records are of no value in getting a mortality rate, and we must seek for data from some other source.

A very interesting discussion of the subject of birth-rate in general, and of the birth-rate of the United States in particular, is given by Dr. Roger Tracy in the supplement to the *Reference Handbook of the Medical Sciences.* The birth-rate of the United States was found to be 31.6 per thousand of population by the census of 1880. Dr. Tracy explains why this figure is much too low. Dr. Billings has estimated the birth-rate for the United States at 36 per thousand. Dr. Tracy estimates the birth-rate in New York city at about 38 per thousand. I have concluded to adopt for my purpose the birth-rate which Dr. Reilly, the Assistant Commissioner of Health, has computed for Chicago—viz., 38.7 per thousand. It certainly is not too large. Dr. Reilly has very carefully computed this ratio after considering all elements of the problem, among which are the character of the population, the marriage rate, etc. I believe that the use of this ratio for computing the number of births and confinements is the only way in which we can obtain this puerperal mortality rate, and that it will be sufficiently accurate to give valuable results for comparison with the puerperal mortality of other countries.
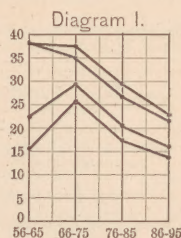
With this explanation of the sources of my data I submit the accompanying tables and diagrams, which explain themselves. They show the rate of mortality from puerperal infection for the four decennial periods, according to the uncorrected figures of the Health Department reports, the puerperal infection mortality rate according to the figures corrected as explained, and the mortality rate from all puerperal affections according to the figures respectively uncorrected and corrected.

It will be seen that the shape of the curves in the diagrams do not differ very materially, whether the mortality rate is computed on the basis of population, of the total number of deaths, of the number of female deaths between twenty and fifty years, or of the number of confinements. Puerperal infection, as shown both by the uncorrected and corrected figures, was greatest in the decennial period 1866-'75 ; it decreased during the next decennium, but not quite as rapidly since. The lower mortality from puerperal infection during the first decennium—that is, between 1856 and 1865—must be accepted with some suspicion on account of the somewhat uncertain character of the statistics. From the fact that the total puerperal mortality during the first period was highest, it is quite probable that puerperal in-
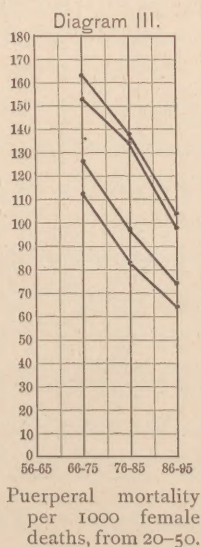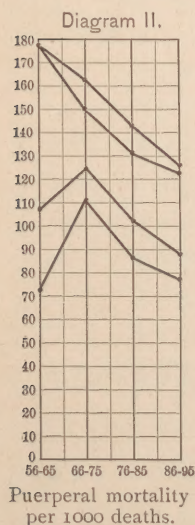
fection was worst at that time. Perhaps it would have been more correct to have adopted another coefficient of correction for this period, but the absence of the records, which were destroyed in the great fire, makes it impossible to get any data. It is at least certain there has been a decrease in the number of deaths from puerperal infection as well as from all puerperal affections.

Diagram I.

Puerperal mortality per 100,000 pop. Puerp. infection uncorrected and corrected; all puerp. diseases uncorrected and corrected.

It should be noted that in all the diagrams the points of intersection of the curves with the vertical lines do not represent the mortality of the middle of the period, but the average mortality of the period. For example, in Diagram I the highest point on the second line does not mean that the mortality was 37.5 per one hundred thousand in the year 1870, but that this was the average mortality of the decennium.

Table III and Diagram III are of especial interest. They cover only the last three decenniums, since the number of female deaths between the ages of twenty and fifty years could not be determined for the years 1856 to 1865. The table shows that from 1866 to 1875, according to the uncorrected figures, more than eleven per cent. of all women who die between twenty and fifty die of the preventable disease, puerperal infection, or, according to the corrected figures, twelve and three quarters per cent. In other words, one hundred and twenty-seven out of every thousand women who died, died of puerperal infection. The record is much better during the last ten years, but still seventy-three out of every thousand deaths are to be ascribed to this cause. The full significance of these figures appears

Diagram II.

Puerperal mortality per 1000 deaths.

Diagram III.

Puerperal mortality per 1000 female deaths, from 20–50.

TABLE A.

	95	94	93	92	91	90	89	88	87	86	Total	85	84	83	82	81	80	79	78	77	76	Total
Rate of puerperal infection mortality per 100 female deaths between 20 and 50 yrs.	6.94	7.14	6.53	5.96	6.15	6.87	8.01	10.35	9.49	9.15		8.34	9.45	13.11	8.67	10.63	7.78	8.75	8.97	10.57	10.18	
Estimated number of female deaths between 20 and 50 yrs.	3,060	2,859	3,295	3,423	3,334	2,723	1,934	1,865	1,770	1,520	25,783	1,462	1,291	1,274	1,408	1,496	1,041	893	791	748	776	11,180
Corrected total puerperal diseases.	323	322	309	294	279	280	219	249	225	175	2,675	179	178	224	184	202	117	120	103	107	125	1,537
Corrected non-infectious puerperal diseases.	110	118	88	90	74	93	64	56	57	36	786	57	56	57	60	43	36	42	32	28	46	457
Corrected other causes.	56	27	30	21	22	27	17	23	22	8	253	18	16	19	27	14	11	16	10	10	22	163
Corrected hæmorrhage post partum.	33	37	32	47	29	38	25	17	21	12	291	23	17	15	20	16	10	11	15	9	13	149
Puerperal convulsions.	21	54	26	22	23	33	12	22	13	12	242	16	23	23	13	13	15	15	7	9	11	145
Corrected puerperal infectious diseases.	213	204	221	204	205	187	155	193	168	139	1,889	122	122	167	122	159	81	78	71	79	79	1,080
Uterine hæmorrhage.	..	..	2	3	4	3	2	5	..	..	19	..	..	..	..	..	1	12	..	18	13	44
Pelvic cellulitis, peritonitis, abscess.	31	20	23	16	13	10	3	6	4	5	131	10	9	12	8	5	4	11	3	11	2	75
Metritis, metro-peritonitis, metro-phlebitis.	..	..	15	14	11	9	9	..	10	6	74	6	11	12	8	11	15	26	23	8	19	139
Total puerperal diseases.	307	312	289	277	265	268	212	243	218	169	2,560	171	168	212	174	194	106	95	90	88	107	1,405
Puerperal non-infectious diseases.	71	93	52	56	44	62	42	36	29	27	512	41	37	40	44	31	31	36	26	19	37	348
Other causes of death.	18	14	1	..	..	..	1	..	1	..	35	..	..	..	..	..	..	2	9	6	3	23
Puerperal ruptura uteri.	..	..	..	..	..	..	..	..	1	..	1	2	..	..	3	2	1	..	..	2	15	25
Hæmorrhage post partum.	13	25	13	29	13	21	13	5	7	7	146	15	8	7	12	10	7	5	15	..	5	84
Placenta prævia.	19	..	7	1	7	5	2	3	2	4	50	4	4	7	8	2	3	1	1	..	..	30
Puerperal convulsions, uræmia, albuminuria.	21	54	26	22	23	33	12	22	13	16	242	16	23	23	13	13	15	15	7	9	11	145
Puerperal mania.	..	..	5	4	1	3	1	6	5	..	38	4	2	3	8	4	3	6	3	5	3	41
Puerperal diseases of doubtful infectious nature.	59	37	53	48	42	44	32	26	42	14	397	24	28	25	24	18	6	..	..	..	3	128
Childbirths.	31	16	37	23	30	27	16	19	24	13	236	21	18	18	13	12	1	..	..	..	2	85
Abortions and miscarriages.	28	21	16	25	12	17	6	7	18	1	161	3	10	7	11	6	5	..	..	..	1	43
Puerperal infectious diseases.	177	182	184	173	179	162	138	181	147	128	1,651	106	103	147	106	145	69	59	58	69	67	929
Puerperal phlegmasia alba dolens.	..	..	3	..	4	3	3	..	1	2	16	2	1	1	..	2	..	..	..	..	..	6
Puerperal fever.	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	43	49	92
Puerperal septicæmia, pyæmia.	155	124	53	53	51	44	33	43	28	37	621	21	12	35	10	19	..	7	13	..	..	117
Puerperal peritonitis, metritis, metro-peritonitis, metro-phlebitis.	22	58	128	120	124	115	102	138	118	89	1,014	83	90	111	96	124	69	52	45	26	18	714
Year.	95	94	93	92	91	90	89	88	87	86		85	84	83	82	81	80	79	78	77	76	

TABLE B.

|	1886–'95.	1876–'85.	1866–'75.	1856–'65.
Average annual population	1,186,577.2	524,478.2	314,165.1	121,995.0
Average annual number of deaths.	21,297.7	10,693.2	7,298.7	2,588.2
Average annual number of female deaths between 20 and 50 years . .	2,578.3	1,118.0	722.3	. . . .
Average annual death-rate per 1,000 population	17.95	20.39	23.23	21.21
TABLE I.—Puerperal mortality rate per 1,000 population—				
From puerperal infection.	0.1391	0.1771	0.2588	0.1541
" " " (corrected)	0.1592	0.2059	0.2932	0.2296
" " diseases.	0.2157	0.2679	0.3495	0.3812
" " " (corrected)..	0.2254	0.2931	0.3756	0.3812
TABLE II.—Puerperal mortality rate per 100 deaths—				
Puerperal infection	0.78	0.87	1.11	0.73
" " (corrected).	0.89	1.01	1.26	1.08
" diseases.	1.22	1.31	1.50	1.79
" " (corrected).	1.25	1.44	1.62	1.79
TABLE III.—Puerperal mortality rate per 100 deaths of females between 20 and 50 years—				
Puerperal infection	6.40	8.31	11.26	. . . .
" " (corrected)	7.33	9.66	12.75	. . . .
" diseases.	9.93	13.47	15.20	. . . .
" " (corrected).	10.38	13.75	16.34	. . . .
TABLE IV.—Puerperal mortality rate per 1,000 confinements—				
Puerperal infection	3.59	4.72	6.69	3.98
" " (corrected).	4.11	5.48	7.58	5.93
" diseases.	5.58	7.13	9.03	9.85
" " (corrected).	5.83	7.80	9.71	9.85
Estimated number of confinements using Reilly's coefficient, 38.7. . . .	459,205	196,972	121,582	47,212
Ratio of puerperal infections to puerperal diseases	64.5 per ct.	66.1 p. c.	74.0 p. c.	38.7 p. c.
Ratio of puerperal infections to puerperal diseases (corrected)	70.6 "	70.3 "	78.1 "	60.2 "

TABLE C.

	Percentage of annual births.	No. of births during last 10 years (estimated).	No. of deaths during last 10 years (puerperal infection).	Mortality rate of puerperal infection per 1,000 births.
January.	8.712	40,005	191	4.77
February.	7.974	36,616	197	5.38
March.	8.547	39,248	192	4.89
April	7.525	34,555	156	4.51
May.	7.563	34,729	130	3.74
June.	7.745	35,564	96	2.70
July	8.593	39,459	131	3.32
August.	9.026	41,447	102	2.46
September.	8.749	40,175	105	2.61
October.	8.550	39,261	92	2.34
November.	8.391	38,532	111	2.88
December.	8.601	39,496	141	3.57

when we reflect that these deaths are not from the ranks of infants or those whose term of usefulness is past, and that the estimate is exceedingly conservative. I was incited to undertake this investigation by the statement of Ingerslev that, excepting consumption, there was no other cause of death that carried off so many women in the prime of sexual life as puerperal infection. Only after thirty-five years are cancer and heart disease more important. This statement is, I think, quite true for Chicago, with the possible exception of our deadly endemics of pneumonia.

In the table of details (Table A) and in Diagram V the mortality rate for puerperal infection is given for each year since 1866. It will be noticed that the highest mortality was in the year 1873, when there were two hundred deaths from puerperal infection to every thousand female deaths between the ages of twenty and fifty years. In the year 1892 the puerperal infection mortality was lowest, being sixty to every thousand female deaths between twenty and fifty.

Diagram IV.

56-65 66-75 76-85 86-95

Puerperal mortality per 10,000 confinements.

Table IV and Diagram IV may be used for a comparison of our puerperal mortality with that of other countries. I shall call your attention only to a comparison with England and Wales and with the Danish cities. The following table gives the puerperal mortality rate for one thousand births, according to Boxall, for all England and Wales, and for London and the provinces separately. The figures are also given for the period from 1847 to 1880 before corrections were made, and from 1880 to 1892 after corrections were made in the mortality from infection. The table also contains the corrected figures for the puerperal mortality in the Danish cities :
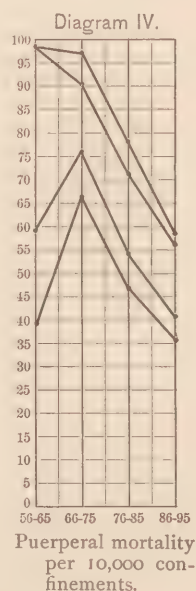
	Deaths per 1,000 births from puerperal infection.	Deaths per 1,000 births from all puerperal affections.
England and Wales, 1847–'92	1.95	4.85
" " " 1847–'80	1.67	5.13
" " " 1881–'92	2.49	4.70
London, 1847–'92	2.13	4.55
" 1847–'80	2.41	5.47
" 1881–'92	2.15	3.74
Provinces, 1847–'92	1.94	4.87
" 1847–'80	1.58	5.00
" 1881–'92	2.56	4.89
Danish cities, 1882–'89 (Ingerslev)	2.94	3.96

It will be seen that during the last decennium the mortality from puerperal infection has been nearly twice as great in Chicago as in London from 1880 to 1892, about two thirds more than that of all England and Wales, and about one third more than that of the Danish cities. The figures for previous years are much more unfavorable for Chicago.

Diagram V.

Table showing the number of deaths due to puerperal infection in 1000 deaths in women between the ages of 20–50 years, by years. Puerperal infection mortality per 1000 females. Deaths between 20–50 years (corrected.)

I will compare the puerperal mortality of Chicago with that of only one American city, New York. Here it will be necessary to use the mortality rate based on the population. The latest figures for that city which are accessible to me are in the report of the New York city Board of Health for 1891, and consequently the last period shows an average for only six years.

The mortality rates are as follows :

	Deaths from puerperal infection per 1,000 population.	Deaths from all puerperal affections per 1,000 population.
New York, 1866–'75.....................	0.1883	0.3436
" 1876–'85.....................	0.1631	0.2841
" 1886–'91.....................	0.1401	0.2522

Diagram VIII shows the comparison between the two cities, using, of course, the uncorrected figures for Chicago. It indicates that the mortality from puerperal infection for the period from 1866 to 1875 was about one third higher in Chicago than in New York. This period includes the years 1869, 1872, and 1873, when puerperal fever may be said to have been epidemic in Chicago. The deaths from infection have decreased much more rapidly in Chicago since this period, until now the infection mortality is very slightly greater in New York than here. The ratio of puerperal infection to puerperal disease is less in New York than in Chicago according to the reports, which accounts for the fact that the total puerperal mortality has been greater there during nearly the entire period of thirty and twenty-six years respectively.

Table C gives the data for the computation and the monthly infection mortality rate for the last decennium. The monthly percentage of all births is computed from the returns of the County Clerk's office. No report has been made for 1894 and 1895, hence the returns from 1884 to 1893, inclusive, were used. By the use of these ratios the number of births per month was estimated on the basis of the total population for the decennium. The number of deaths is taken from the annual reports. The figures of the fourth horizontal column are then computed in the ordinary way. Diagram VI is a

Diagram VI.
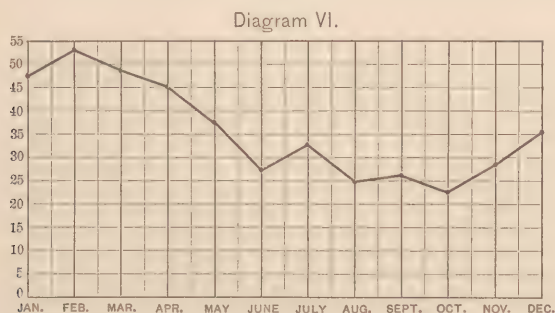
Puerperal infection mortality rate per 1000 confinements by months for 1886–'95. (Uncorrected.)

representation of these infection mortality rates. It will be seen that the death-rate is much higher during the first three or four months of the year, being greatest in February, decreases steadily until in June it is only about one half of what it was in February, rises somewhat in July, falls (fluctuating slightly) in August and September, till the

lowest point is reached in October, when it rises again in November
and December.   In general it may be said that more deaths occur
from puerperal infection during the winter and spring than during
the summer and autumn months.   This fact also agrees with the con-
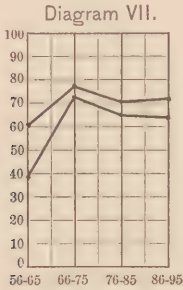
Percentage of puerperal infection mor-
tality to total puerperal mortality.
From uncorrected and corrected
figures.
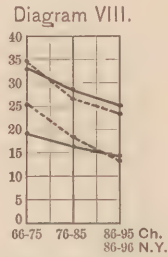
Puerperal mortality per 100,000 popula-
tion.   Lower lines puerperal infec-
tion.   Upper lines all puerperal dis-
eases.   Black, New York.   Dotted,
Chicago.

clusions to be drawn from the statistics of New York, Brooklyn, Bos-
ton, and Philadelphia.   The following table, taken from the census
reports of Dr. Billings, above referred to, gives the number of deaths
from puerperal fever by months in these four cities for the six years
ending May 31, 1890 :

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
New York...........	215	212	264	233	209	178	176	159	143	133	146	168
Brooklyn............	78	87	92	77	75	78	72	54	52	58	64	78
Boston..............	62	72	77	75	47	33	43	37	45	40	47	48
Philadelphia.........	35	42	56	53	40	26	28	35	30	27	25	39
Totals..........	390	413	489	438	371	315	319	285	270	258	282	333

The mortality rates based on the number of confinements would,
no doubt, make the larger mortality of the winter and spring much
more apparent, since the birth-rates in these cities probably agree
more or less with those in Chicago, where the number of births in
summer and autumn is quite as great as in winter and spring.   How-
ever, the figures as given prove the same statement that was made for
Chicago—viz., that more deaths from puerperal infection occur in the
winter and spring.   Boxall has found the same thing to be true in
England and Wales.   The explanation is doubtless chiefly to be found

in the fact that the houses, beds, and persons of the poorer people are not as clean in the winter and spring as in summer and autumn.

This paper is chiefly or wholly statistical in character, and is confined to a consideration of the mortality from puerperal infection. I will consider further only one or two points concerning the cause or source of infection that may be suggested by the statistics.

First, it may be noted from the tables that there has been a great improvement in the last twenty years. The date of this improvement corresponds with the date of the spread and acceptance of the teachings of Lister, and it can rightly be attributed to the knowledge we have gained of the causes and sources of infection, and the application of this knowledge to practice.

Secondly, the figures show that this improvement has now ceased, while there is still a very large mortality—a mortality that should be almost or entirely done away with. The mortality rate for the last two years is higher than for the preceding four years, and the deaths still number seventy to every thousand female deaths between twenty and fifty years.

Who is responsible for this large continuing mortality? Physicians or midwives? It is impossible to answer this question from the records. It would be practically useless to attempt to compare the birth certificates with the death certificates. Not only is the birth registration very incomplete, but many times the accoucheur omits to indicate whether he or she is a physician or midwife. Hence one can only suggest the probabilities in the case. Dr. Neely, Registrar of Vital Statistics in the County Clerk's office, informs me that probably two thirds to three fourths of the returns made to him are made by midwives. It is well known that physicians are much more careless in the matter of returning birth certificates. Now, if we assume that one half of all births are returned, and that all those not returned are in the practice of physicians, from one third to three eighths of all obstetrical practice is in the hands of midwives. No doubt the midwives sometimes fail to report births, and it would seem as near an approximation to the truth as we can reach to say that midwives attend two fifths of all confinement cases. It is pertinent to ask, How does the training of physicians compare with that of midwives? There can be no doubt as to the answer. In recent years the principles of asepsis and antisepsis are so well taught from our surgical, gynæcological, and obstetrical chairs that the teaching can not fail to influence the younger generation of physicians. On the other hand, the training of midwives has been singularly neglected by physicians, the medical schools,

and the community. Practically no safeguards to the community exist in the way of examination of midwives, control of their practice, etc. The course of instruction in the so-called schools for midwives is, so far as I am informed, very inefficient. They are largely diploma mills which graduate whatever material comes to them, without regard to mental or moral qualification. One result of this is the well-known fact that one quite important part of their practice is that of inducing abortion. Whether these facts have a bearing on the question as to the relative responsibility of physicians and midwives in the matter of puerperal infection I leave unanswered, merely suggesting that perhaps the wretched condition of our midwifery practice may be the reason why our puerperal statistics are so much worse than those of Europe. I will also add that there seems no hope for improvement in this condition of affairs until midwives are put under as strict control here as in Europe, and until the education of midwives is cared for by our responsible medical colleges.

In conclusion, I will only add two other probable causes of our very large death-rate from puerperal infection—viz., the almost universal practice of frequent internal examination of the parturient woman and the too frequent use of the forceps. These I believe to be the chief faults in obstetrical practice. When the internal examination comes to be regarded in the nature of an operation for diagnostic purposes only to be made in accordance with well-defined indications and after thorough subjective disinfection and disinfection of the patient, and when the use of the forceps is restricted to the classical indications, danger to mother or child, the puerperal mortality in the practice of physicians will be largely eliminated.

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